Amendments To The Claims

The listing of claims will replace all prior versions, and listings, of claims in the application.

1. (Currently Amended) An apparatus for abrading a work piece, the apparatus comprising:

~~two support members disposed a distance from each other;~~

a base;

at least one support member physically coupled to said base, wherein said at least one support member forms a plane;

a carriage member slidably mounted to said ~~two support members~~ at least one support member, wherein said carriage member is coupled to said base only by said at least one support member forming said plane;

at least one vertical drive mechanism configured to reciprocate said carriage member in a vertical direction along said ~~two support members~~ at least one support member;

a spindle rotationally mounted to said carriage member and configured to rotate about a central axis, said spindle having a channel disposed longitudinally therethrough, and wherein said spindle is disposed outside said plane;

an upper abrading wheel having a first working surface, wherein said upper abrading wheel comprises a plurality of first conduits, each having a first orifice and a second orifice, and wherein said first orifice of each of said plurality of first conduits is disposed at said first working surface and said second orifice of each of said plurality of first conduits is in fluid communication with said longitudinal channel of said spindle; and

a lower abrading wheel having a second working surface, said second working surface of said lower abrading wheel disposed parallel to and in vertical opposition to said first working surface of said upper abrading wheel.

2. (Original) The apparatus for abrading a work piece of claim 1, further comprising a rotary coupler coupling said spindle and said upper abrading wheel, wherein said rotary coupler comprises a plurality of fluid distribution channels, each fluid distribution channel in fluid communication at a first end with said longitudinal channel of said spindle

and in fluid communication at a second end with said second orifice of one of said plurality of first conduits of said upper abrading wheel.

3. (Original) The apparatus for abrading a work piece of claim 2, said rotary coupler comprising:

a driver hub mounted to said spindle, said driver hub comprising at least a portion of each of said plurality of fluid distribution channels;

a universal joint mounted to said driver hub; and

a housing mounted to said universal joint, wherein said upper abrading wheel is attached to said housing.

4. (Original) The apparatus for abrading a work piece of claim 3, further comprising a plurality of second conduits, each having a first end and a second end, wherein said first end of each of said plurality of second conduits is coupled to said second end of one of said plurality of distribution channels and wherein said second end of each of said plurality of second conduits is coupled to said second orifice of one of said plurality of first conduits.

5. (Original) The apparatus for abrading a work piece of claim 4, the apparatus further comprising an upper abrading wheel support member comprising a plurality of third conduits, each having a first and a second end, wherein said first end of each of said plurality of third conduits is in fluid communication with said second end of one of said plurality of said second conduits and said second end of each of said plurality of third conduits is in fluid communication with said second orifice of one of said plurality of first conduits.

6. (Original) The apparatus for abrading a work piece of claim 1, further comprising a rotary lead-through member mounted to said spindle and configured to permit said spindle to rotate relative thereto.

7. (Original) The apparatus for abrading a work piece of claim 6, said rotary lead-through member having at least one second conduit disposed therein, said at least one second conduit in fluid communication with said longitudinal channel of said spindle.

8. (Original) The apparatus for abrading a work piece of claim 7, wherein said second conduit of said rotary lead-through member is connected to a fluid source.

9. (Original) The apparatus for abrading a work piece of claim 1, wherein said spindle is coupled to a rotary drive mechanism configured to rotate said spindle about said central axis.

10. (Original) The apparatus for abrading a work piece of claim 9, said rotary drive mechanism coupled to a motor for actuating said rotary drive mechanism.

11. (Original) The apparatus for abrading a work piece of claim 9, said rotary drive mechanism comprising at least a first pulley and a second pulley and comprising a drive belt configured to cause the rotational motion of said first pulley upon rotation of said second pulley.

12. (Currently Amended) The apparatus for abrading a work piece of claim 1, wherein said carriage member is coupled to at least two linear ball bearing slide assemblies, each mounted to ~~one of~~ said ~~two support members~~ at least one support member for effecting vertical movement of said carriage member.

13. (Original) The apparatus for abrading a work piece of claim 1, wherein said vertical drive mechanism comprises one of a pneumatic cylinder, a hydraulic cylinder, and an air/oil cylinder.

14. (Cancelled)

15. (Withdrawn) A rotary coupler for coupling an abrading wheel to a spindle having a longitudinal channel for receiving a fluid, the rotary coupler comprising:

a driver hub configured to be mounted to the spindle, said driver hub comprising a plurality of fluid distribution channels configured for fluid communication with the longitudinal channel of the spindle;

a universal joint mounted to said driver hub, said universal joint comprising a plurality of passageways, each passageway in fluid communication with one of said plurality of fluid distribution channels; and

a housing mounted to said universal joint and configured for attachment to the abrading wheel.

16. (Withdrawn) The rotary coupler of claim 15, further comprising a plurality of tubes, each tube coupled at a first end to one of said plurality of passageways of said universal joint and configured to be coupled at a second end to the abrading wheel.

17. (Withdrawn) A method for abrading a work piece using an abrading apparatus having an upper abrading wheel and a lower abrading wheel, the method comprising the steps of:

positioning a work piece on the lower abrading wheel;

moving a carriage member vertically downward along at least two vertical support members disposed in a plane, said carriage member supporting a spindle disposed outside said plane and coupled coaxially to the upper abrading wheel;

contacting the work piece with a working surface of the upper abrading wheel;

rotating said spindle and the upper abrading wheel;

rotating the lower abrading wheel;

urging a coolant through a longitudinal channel disposed within said spindle and through a plurality of conduits disposed within said upper abrading wheel and in fluid communication with said longitudinal channel so that said coolant is delivered to said working surface of the upper abrading wheel; and

moving said carriage member vertically upward along said at least two vertically disposed support members.

18. (Withdrawn) The method for abrading a work piece of claim 17, further comprising the step of urging a gas through said longitudinal channel disposed within said spindle and through said plurality of conduits disposed within the upper abrading wheel to said working surface of the upper abrading wheel.

19. (Withdrawn) The method for abrading a work piece of claim 17, the step of moving said carriage member vertically downward comprising the step of moving said carriage member from a loading/unloading position to a working position.

20. (Withdrawn) The method for abrading a work piece of claim 17, the step of moving said carriage member vertically upward comprising the step of moving said carriage member from a working position to a loading/unloading position.

21. (Withdrawn) The method for abrading a work piece of claim 17, the steps of moving said carriage member vertically upward and downward each comprising the step of sliding said carriage member along at least two linear ball bearing assemblies, each linear ball bearing assembly attached to one of said at least two vertically disposed support members.

22. (Withdrawn) The method for abrading a work piece of claim 17, the steps of moving said carriage member vertically upward and downward each comprising the step of activating at least one vertical drive device attached to said carriage member.

23. (Withdrawn) The method for abrading a work piece of claim 17, wherein the upper abrading wheel is rigidly coupled to said spindle and wherein the step of rotating said spindle and the upper abrading wheel comprises activating a rotary drive mechanism that is configured to rotate said spindle.

24. (Currently Amended) An apparatus for abrading a work piece, the apparatus comprising:

a base;

~~two support members~~ at least one support member fixedly attached to said base and extending vertically from said base, said ~~two support members~~ at least one support member forming ~~disposed a distance from each other in~~ a plane;

a carriage member slidably mounted to said at least ~~two support members~~ one support member and at least partially extending in a direction substantially perpendicular to said plane wherein said carriage member is coupled to said base only by said at least one support member;

at least one vertical drive means for reciprocating said carriage member vertically along said at least ~~two support members~~ one support member;

a spindle supported by said carriage member and disposed outside said plane, said spindle configured to rotate about a central axis, wherein said spindle has a longitudinal channel that is configured to receive a fluid;

a rotary drive means for rotating said spindle about said central axis;

a lower abrading wheel assembly disposed partially within said base, said lower abrading wheel assembly comprising a lower abrading wheel with a first working surface;

an upper abrading wheel assembly comprising an upper abrading wheel having a second working surface, said second working surface of said upper abrading wheel disposed parallel to and in vertical opposition to said first working surface of said lower abrading wheel, wherein said upper abrading wheel assembly comprises a fluid distribution system in fluid communication with said longitudinal channel of said spindle and configured to distribute a fluid to said second working surface.

25. (Original) The apparatus for abrading a work piece of claim 24, said upper abrading wheel assembly further comprising a rotary coupler that couples said spindle and said upper abrading wheel.

26. (Original) The apparatus for abrading a work piece of claim 25, said fluid distribution system comprises a plurality of fluid distribution channels disposed within said rotary coupler and a plurality of first conduits disposed within said upper abrading wheel, wherein each of said plurality of fluid distribution channels is in fluid communication at a

first end with said longitudinal channel of said spindle and is in fluid communication at a second end with one of said plurality of first conduits of said upper abrading wheel.

27. (Original) The apparatus for abrading a work piece of claim 26, said fluid distribution system further comprising a plurality of tubes, each having a first end and a second end, wherein said first end of each of said plurality of tubes is in fluid communication with one of said plurality of fluid distribution channels and said second end of each of said plurality of tubes is in fluid communication with one of said plurality of first conduits of said upper abrading wheel.

28. (Original) The apparatus for abrading a work piece of claim 25, said rotary coupler comprising:

a driver hub mounted to said spindle, said driver hub comprising at least partially said plurality of fluid distribution channels;

a universal joint mounted to said driver hub;

a housing mounted to said universal joint, wherein said upper abrading wheel is attached to said housing.

29. (Original) The apparatus for abrading a work piece of claim 24, further comprising a rotary lead-through member having at least one passageway disposed therein, said at least one passageway in fluid communication with said longitudinal channel of said spindle and connected to a fluid source.

30. (Currently Amended) The apparatus for abrading a work piece of claim 24, wherein said carriage member is coupled to at least two linear ball bearing slide assemblies, each mounted to ~~one of said two support members~~ said at least one support member and configured for vertical reciprocation of said carriage member.

31. (Original) The apparatus for abrading a work piece of claim 24, wherein said vertical drive means comprises one of a pneumatic cylinder, a hydraulic cylinder, and an air/oil cylinder.

32. (Original) The apparatus for abrading a work piece of claim 24, said rotary drive means comprising at least a first pulley and a second pulley and comprising a drive belt configured to cause the rotational motion of said first pulley upon rotation of said second pulley.

33. (Original) The apparatus for abrading a work piece of claim 32, said apparatus further comprising a motor configured to rotate said first pulley.

34. (Currently Amended) An apparatus for abrading a work piece, the apparatus comprising:

~~two support members disposed in a plane;~~

a base;

at least one support member physically coupled to said base, wherein said at least one support member forms a plane;

a carriage member slidably mounted to said ~~two support members~~ at least one support member, wherein said carriage member is coupled to said base only by said at least one support member;

at least one vertical drive mechanism configured to reciprocate said carriage assembly in a vertical direction along said at least one support member ~~two support members~~;

a spindle rotationally mounted to said carriage member and disposed outside of said plane, said spindle configured to rotate about a central axis;

an upper abrading wheel assembly coupled to said spindle, said upper abrading wheel assembly comprising an upper abrading wheel having a first working surface; and

a lower abrading wheel having a second working surface, said second working surface of said lower abrading wheel disposed parallel to and in vertical opposition to said first working surface of said upper abrading wheel.

35. (Currently Amended) The apparatus for abrading a work piece of claim 34, ~~said spindle disposed an equal distance from each of~~ said at least one support member comprising two support members.

36. (Original) The apparatus for abrading a work piece of claim 34, wherein said spindle is coupled to a rotary drive mechanism configured to rotate said spindle about said central axis.

37. (Original) The apparatus for abrading a work piece of claim 36, said rotary drive mechanism coupled to a motor for actuating said rotary drive mechanism.

38. (Currently Amended) The apparatus for abrading a work piece of claim 37, wherein said at least one support member comprises two support members and wherein said motor for actuating said rotary drive mechanism is at least partially disposed between said two support members.

39. (Original) The apparatus for abrading a work piece of claim 36, said rotary drive mechanism comprising at least a first pulley and a second pulley and comprising a drive belt configured to cause rotational motion of said first pulley upon rotation of said second pulley.

40. (Currently Amended) The apparatus for abrading a work piece of claim 34, wherein said carriage member is coupled to at least two linear ball bearing slide assemblies, each mounted to ~~one of said at least two support members~~ said at least one support member for effecting vertical movement of said carriage member.

41. (Original) The apparatus for abrading a work piece of claim 34, wherein said vertical drive mechanism comprises one of a pneumatic cylinder, a hydraulic cylinder, and an air/oil cylinder.

42. (Original) The apparatus for abrading a work piece of claim 34, said spindle having a channel disposed longitudinally therethrough and said upper abrading wheel comprising a plurality of first conduits, each having a first orifice and a second orifice, wherein said first orifice of each of said plurality of first conduits is disposed at said first

working surface and said second orifice of each of said plurality of first conduits is in fluid communication with said longitudinal channel of said spindle.

43. (Original) The apparatus for abrading a work piece of claim 42, the upper abrading wheel assembly further comprising a rotary coupler that couples said spindle and said upper abrading wheel, wherein said rotary coupler comprises a plurality of fluid distribution channels, each fluid distribution channel in fluid communication at a first end with said longitudinal channel of said spindle and in fluid communication at a second end with said second orifice of one of said plurality of first conduits of said upper abrading wheel.

44. (Original) The apparatus for abrading a work piece of claim 43, said rotary coupler comprising:

a driver hub mounted to said spindle, said driver hub comprising at least a portion of each of said plurality of fluid distribution channels;

a universal joint mounted to said driver hub; and

a housing mounted to said universal joint, wherein said upper abrading wheel is attached to said housing.

45. (Original) The apparatus for abrading a work piece of claim 34, further comprising a rotary lead-through member mounted to said spindle and configured to permit said spindle to rotate about said central axis, said rotary lead-through member having at least one second conduit disposed therein, wherein said at least one second conduit is in fluid communication with said longitudinal channel of said spindle.

46. (Original) The apparatus for abrading a work piece of claim 45, wherein said second conduit of said rotary lead-through member is connected to a fluid source.